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ABSTRACT

This report presents the findings and recommendations of an Information Technology Study Team, which was appointed in July 1995 to develop a technology strategy for the North Carolina Community College System (NCCCS) Office. After reviewing the results of staff surveys and input from the college presidents, and conducting a series of interviews, the study team identified the strengths and constraints of the system's approach to information technology. Based on this assessment, it developed a vision for the future, made a number of recommendations, and devised an implementation plan. The report describes the background information that led to the development of the recommendations, including the current environment of information management systems, and the strengths and constraints faced by NCCCS in planning, developing, and implementing technology; and presents the resulting vision statement. It then sets forth recommendations, with action steps and expected outcomes, in the areas of planning, holistic approach to technology, data access, administrative systems, and training. A glossary of terms used in the report is also provided. Appended are (1) current systems, which include a chart of administrative systems currently supported by information services; (2) job descriptions and committee charges; (3) surveys with charts and graphs; and (4) tables of cost projections. (VWC)

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ED 431 495

IS Technology Study
Findings and Recommendations

North Carolina Community College System

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INTRODUCTION

The North Carolina Community College System (NCCCS) appointed a team to develop an information technology strategy for the System Office. The members of the team were:

Chair:

- Parker Chesson, Executive Vice President and Vice President for Planning and Research

Team Members:

- Major Boyd, Director, Library Services
- Keith Brown, Director, Planning and Research
- Stephanie Deese, Associate Director, JTPA Programs
- Danny Green, Executive Assistant to the President
- Steve Ijames, Director, Information Services
- Larry Morgan, Director, Auditing and Accounting
- Benson Otovo, Vice President for Business and Finance
- Gerald Pumphrey, Director, Tech Prep Program
- Parks Todd, Director, Telecommunications
- Bethany M. Baxter, Facilitator

Before the study began, letters were sent to the presidents of all the colleges, and surveys were distributed to all staff of the System Office. At the beginning of the study, the results of those surveys were presented to the team.[1] The team then spent two weeks interviewing internal and external clients of the System Office, reviewing the responses from the colleges, summarizing the results of the surveys and interviews, and identifying the strengths and weaknesses in the system. Following this, the team developed a vision for the System Office, compiled a list of recommendations, developed an implementation plan, and identified the benefits.

[1] See Appendix C

EXECUTIVE SUMMARY

In July, 1995, an Information Technology Study Team was appointed to develop a technology strategy for the North Carolina Community College System Office. The team, based on the results of surveys distributed to all staff, the responses to letters sent to the presidents of the North Carolina Community College System by the System President, and interviews of System Office staff, college presidents, and college system administrators, identified the strengths and constraints that exist in the system's approach to information technology and developed a vision for the future. An analysis of the strengths and constraints, as they relate to the vision, led the team to make a number of recommendations and to develop an implementation plan. This plan addresses both the internal information technology needs of the System Office staff and the implications of information technology as it affects the staff's current and envisioned roles as leaders, advocates, coordinators, and information providers for the North Carolina Community College System.

Historically, the System Office has played an important role in the delivery of coordinated system-wide information services, including the 1982 development of an integrated administrative system (IIPS) and the more recent coordination of the purchase of a centralized library system that will be used by 36 colleges. However, information technology is no longer focused on a computer, programmed by experts, that delivers data processing applications and reports, but on a network where end users (faculty, staff and students) find the information they need, wherever it may be. This information may range from a comparison of student success rates for administrators to an article in the library of the University of Tasmania for students or faculty. This wide availability of information has been accompanied by an exponential increase in requests for information from regulatory agencies. Frequently, such requests require linkages to information from multiple sources.

In recent years, demands for better information, emphasis on local and wide-area networking, and the rapid advancement of workstations attached to these networks has placed enormous constraints on human and financial resources at both the System Office and in the colleges. As a result, the primary focus of this study has been to reevaluate the role of the System Office as it uses information technology to provide leadership, advocacy, coordination, and information for the system. Furthermore, the System Office's role in providing similar support for the colleges' use of information technology was reevaluated.

Therefore, to provide students, faculty, staff, and the community full access to, support for, and training for using information technologies (1) in order to live and work in an information society; (2) to allow the system to consider ways in which technology can be utilized to provide more efficient and cost-effective operations; and (3) to provide better information on which to base decisions, the key recommendations are:

- For the System:
  - Make information technology a priority for the System.

- Develop, with the colleges, a system-wide plan that will clarify new roles for the colleges and the System Office, and identify the appropriate infrastructure required to support these roles.
- Expand the services provided by the System Office to include networking expertise, enhanced library support, and support for the use of information technology in instructional areas.
- Identify data required for accountability measures and establish a system-wide approach to data, including the establishment of an institutional research database on the network.
- Reassess the direction and design of the current administrative application development project, and, in light of that assessment, develop a plan to enhance the administrative systems so that they will support efficient and cost-effective operations and satisfy today's information requirements.
- Provide training on emerging technologies for all system technical staff by establishing an Information Technology Training Center.

- For the System Office:
  - Provide tools to enhance the efficiency and effectiveness of the System Office staff. These include voice mail, FAX capability on the network, and information technology that will enhance presentations.
  - Place the responsibility for determining and coordinating training needs in the Personnel Office, develop a training plan, and train System Office staff so that they will be able to take full advantage of the tools available to them.

Implementing this plan will:

- Provide a focus on information technology.
- Enable the System Office to provide leadership for the use of information technology.
- Assist colleges in making major investments in technology with the security that they will be able to participate in the sharing of state wide resources and be able to plan their investments against reliable dates for the beginning and end of product/standard life cycles.
- Provide enhanced library services.
- Support the development of new learning models.
- Provide an institutional data resource for the System that will support all users and enable them to make wise decisions based on knowledge and information.
- Allow the System to move resources from administrative tasks to the support of the academic mission.
- Provide leading-edge technical support for the System.
- Maximize the skills of the System Office staff.

CURRENT ENVIRONMENT

There are currently three groups managing information systems in the System Office. These include: Information Services; Library Services; and Telecommunications. Furthermore, the community college system is involved in several networking initiatives across the state.

1. *Information Services*

The Information Services Section serves the data processing, information analysis, and office automation needs of the System Office and the colleges in the North Carolina Community College System. This includes the planning, design, development, implementation and maintenance of computer-based information systems and office automation systems which serve the needs of the System Office, the colleges, and federal and other state users of community college information[2]. In addition, the division provides training and technical support to the 56 colleges using the Institutional Information Processing Systems (IIPS) software package and Prime/UNIX computer hardware systems for administrative information processing.

Current hardware and other resources supported by this division include: Prime 5370; Prime 4250; Sun S20FX1; IBM RS 6000; and Bull SCO UNIX; 185 IBM compatible computers; time-sharing on the IBM mainframe at the State Computing Center; and a Novell Network running over an Ethernet backbone at the System Office. The systems that are running on the PRIMEs are currently being ported to UNIX platforms. There are currently 25 staff in this section.

The major responsibilities of the Information Services Section are:

- To provide computing hardware/software operations systems support to the colleges and System Office. This includes providing technical support to colleges in resolving system problems, pre-release testing of operating systems, and operating System Office mini-computer systems. This office also serves as the primary disaster recovery site for the colleges.
- To provide office automation support and training for staff in the System Office and at the colleges. This includes word processing, electronic mail, calendar management, and spreadsheets.
- To plan and implement a data communications network linking all 58 colleges, the Center for Applied Textile Technology (CATT), and the System Office. This network also allows direct login of IS technical staff to remote computers.
- To continue the development of an Information Resource Center for the purpose of managing the collection and analysis of information from various sources (e.g., NCCCS, University of North Carolina Education Computing Service (ECS), census data, business and industry). This includes the operation of a micro-computer lab to provide information

[2] See Appendix A

analysis and to train System Office and college staff in the use of PC technology.

- To provide System Office Local Area Network (LAN) and PC support. This includes providing Internet access and Internet E-mail to all users and making a UNIX-based Internet server accessible to college users who have no Internet access.
- To plan, develop, implement, maintain, train staff on, and provide technical support for application information systems that meet the needs of the 58 colleges, CATT, and the System Office.

2. ***Library Services***

Library Services provides appropriate state-level leadership and direction to the community colleges. In addition, Library Services is responsible for developing and interpreting state-level policies and serves in an advocacy role. Services provided include:

- Acquisition - Library Services selects vendors and orders books for the community colleges.
- Cataloging - Library Services provides customized cataloging and processing of books for community colleges. Cataloging is done through an on-line shared cataloging system which is part of the On-line Computer Library Center (OCLC).
- Technical Assistance - Library Services provides assistance to personnel at community colleges responsible for coordinating library services. Assistance includes, but is not limited to, marketing strategies, professional development, interpretation of SACS criteria, grant-writing, automation, planning and construction.

At the present time, 26 libraries are automated using Dynix software. Twenty-two of these systems reside on Prime computers. In addition to Dynix, there are nine other library software systems being used. In total, approximately 50 college libraries are automated. Because the Prime computer is no longer manufactured, it has become necessary for those schools using Prime computers to move to another system, preferably UNIX-based.

Currently, Library Services is directing the implementation of a host-based library system, the Dynix Automation Center (DAC). The DAC is a centralized library automation system using the Dynix Library Software. Ameritech Library Services (ALS) will provide a Data General Avion Computer and system administrators to manage and maintain the system. The System Office will house the equipment and provide office space for the system administrators. ALS will migrate the existing Dynix clients to the new software at no cost and will provide access to cataloging; circulation; modules such as Public Access Catalog, Reserve Book Room, Community Resources, and Dial Pac; and the gateway modules for an annual per-user rental fee. Additional resources, such as a serials module, may be used for an additional fee.

Thirty-six schools will initially participate in the DAC. Three other schools, which use Dynix software, are migrating to Horizon, the client server version of Dynix, and will not be fully compatible with the DAC. It is anticipated that all schools will

eventually migrate to Horizon (or a later-day version) when it becomes cost-effective.

The identified benefits of an integrated, networked library software package which can be used by all colleges include:

- Enhanced sharing of library resources.
- Maintaining a single system instead of 58 systems.
- Outsourcing maintenance to ALS.
- Direct uploading of OCLC bibliographic/catalog records.
- Accessing Internet.

3. ***Telecommunications***

The role of the Telecommunications Section is to help provide the Community College System with a telecommunications/distance learning network that will enable it to use modern technologies to carry out its educational, developmental, and public service missions in a society where economics, demographics, employment opportunities and lifestyles are in rapid change.

The major responsibilities of the Telecommunication Section include:

- Provide production and/or delivery of staff development programming. This includes the development of original programming, as well as the acquisition of pre-produced programming. Delivery methods include satellite transmission and the North Carolina Information Highway (NCIH).
- Administer the telecourses aired by UNC-TV and offered by the colleges. System Office duties include coordinating the selection, acquisition, and airing of pre-produced telecourse series, support to the college telecourse administrators/faculty, and centralized reporting of enrollment.
- Provide guidance and assistance to the 58 colleges and CATT in the area of two-way video networking. The majority of this responsibility is focused on the development of video classroom sites interconnected with the North Carolina Information Highway. This includes assistance in site selection, faculty/staff training, and programming development.
- Assist the colleges in the development of alternate delivery methods of instruction. This responsibility is one of continual change, depending on trends in technology.
- Assist with the System's development of video production and distribution capabilities, including the acquisition and editing of materials, as well as distribution via videotape, ITFS, community cable systems, and fiber/data networks.
- Provide the System Office with video production and distribution requirements, including acquisition, editing, CCTV system, and satellite down link capabilities.

4. ***Networking Initiatives***

Networking services are currently provided by various sources. Telephone (voice) service is provided by the State Telecommunications Service (STS). Video service (EDNET) is provided to all colleges via satellite, managed by NCCCS. Twenty-three colleges have, or will have, two way interactive video capability on an Asynchronous Transfer Mode (ATM) network, managed by STS, called the North Carolina Information Highway (NCIH).

There are currently three statewide networks used by the community college system. These are:

- Lincnet, an X.25 network developed by the University of North Carolina Education Computing Service (ECS), which has been the basis for NCCCS data communications. Lincnet is being discontinued, and the system will migrate to Anchornet by December 1, 1995.
- Anchornet, a TCP/IP network currently supported by STS, which will provide 56 Kbps data communication to all of the community colleges and will support broader Internet access. Higher speeds are available on a distance differentiated cost basis.
- North Carolina Information Highway, a statewide network that currently supports interactive video and has been planned to integrate voice, video and data. Twenty-three community college sites will use NCIH for data transmission. Current efforts are in a research and development mode, and there are major concerns about future funding.

Local Area Network (LAN) standards for video are published by NCIH. LAN standards for data are published in the *STS 1000 LAN Standards*. There are no standards for voice.

Colleges are responsible for planning and implementing all campus networks (voice, video and data). Some colleges have planned and implemented significant data communications LAN's, primarily using the STS LAN standards. However, approximately 70 percent of the colleges have no unifying campus LAN technology in place.

STRENGTHS

Throughout the information gathering process, the following strengths were emphasized:

1) The Presidents' Association and other professional organizations play a strong and productive role in helping set direction for the community college system.

2) The system, both in the System Office and on the campuses, has a support staff of dedicated individuals who are service oriented. Staff know and respect each other and work well together.

3) The staff in the System Office are positioned to change and have been given access to technology. There is a common belief that it will bring needed efficiency and improve the work environment.

4) The System Office provides centralized services that were collaboratively developed and that are appreciated by the colleges. These include: IIPS; EDNET at all colleges; DAC which will be used by 36 colleges; and statewide site licenses for some software.

5) Community colleges are currently involved in many successful collaborative ventures with external constituencies such as the military, businesses, public schools, communities, high schools, Tennessee Valley Authority, Indian reservations and the Western Consortium.

6) The System Office has been an advocate for the use of information technologies for administrative applications, for the use of selected instructional technologies, and for unified budget requests to the legislature.

7) Colleges are moving forward, installing local area networks, linking campuses, linking to communities, experimenting and doing new things in new ways.

CONSTRAINTS

1. ***The rapidly changing directions of technology, complicated by ongoing external and internal political and economic constraints, have made it difficult to plan for and implement technology in the North Carolina Community College System.***

Successful implementation of an information technology system depends upon vision, leadership, planning, preparation, and resources. The accelerating evolution of information technology creates difficulties in developing a vision that is sustainable over the time frame necessary to attain it in a system as large, complex and decentralized as the North Carolina Community College System. The constant change creates a moving target in both the capacity of technology and the demands placed upon it. It also fosters a climate of uncertainty for making decisions about which technologies to adopt and when to implement them.

During a time when many issues and needs have competed for the attention of top leadership and resources, not enough effort has been made to build a system-wide vision of how information technology can transform the way services are provided to internal and external customers. In the absence of this preparation, there is variance in the leadership for implementing information technology in the colleges and within the System Office.

The role of information technology in the teaching/learning process is not widely understood by the political leadership, and it has not been implemented in North Carolina so as to produce a conclusive body of demonstrable outcomes. For these reasons, a comprehensive and sustained funding plan for instructional use of information technology for the community college system has not emerged.

In the absence of a long-term funding commitment, colleges and the System Office have implemented technology plans on a piecemeal basis as funds became available. In this process, total implementation costs have not always been identified. Hardware and software have often been acquired without proper planning for maintenance, technical support, and training. Legal and regulatory parameters often constrain the choice of resources or lead to the implementation of systems that lack compatibility or are difficult to maintain. Little attention has been given to future needs to integrate voice, video, and data media as a seamless set of information resources.

Financial resources that have been available for information technology at the System Office have been limited and are not directly related to growth patterns in the system. College funds for information technology come from the FTE-based funding formula and limited equipment budgets.

As a result: The practical effect of the current funding strategy and the lack of a statewide plan has been an uneven implementation of information technology among the colleges. These inequities are exhibited in terms of access to appropriate equipment, technical preparation of the staff, networking capabilities on campus, and application of technology in the teaching/learning process. Costs have been significant for both the System Office and the colleges as they

have attempted to accommodate to the individual differences/needs of the colleges and current statewide directives. For example:

- There is no clear overall state plan, encompassing everything from the basic definition of information technology to the provision of clear guidelines and standards for local area networking.
- The System Office and the colleges may be purchasing inappropriate technology.
- In the absence of mandated time frames for the movement to the UNIX system, Information Services will be required to support multiple platforms for an indefinite time period.
- Three colleges do not use IIPS, and, in the absence of statewide standards, there may be delays in reporting when mandates change.
- Local college variations in technological resources, and access to those resources, result in information being transmitted to the System Office in multiple formats, making it difficult for the System Office to automate activities.
- Replacement plans do not exist, and many colleges are using equipment which is outdated. This makes it difficult to stage the implementation of new systems, sometimes resulting in the development of dual systems - for the "haves" and "have-nots."

2. ***There has not been a holistic approach to information technology at either the System Office or within the community college system.***

Colleges are at various levels in the implementation of information technology. There is tremendous variation from campus to campus in such areas as:

- Integration of academic and administrative computing.
- Integration of voice, video and data.
- LAN standards, design, and implementation.
- Policies on who may have access to data.
- Faculty, student, and staff access to network resources.
- Role of the PC and mainframe.
- Campus-wide standards for workstations.

All colleges have installed phone systems, but standards have not been adopted, so sophistication differs from college to college. Costs for high-speed access to statewide data networks are distance differentiated, making such access very expensive for many of the smaller or more rural colleges. The monthly communications access cost is a serious constraint in the expansion of the NCIH. Therefore, only 23 colleges are, or plan to be, on it at this time.

Similarly, there has not been an integrated view of information systems within the System Office. Emphasis has been placed almost exclusively on computers and not on the integration and optimum utilization of voice, video and data. For example:

- The phone system does not provide voice mail.
- Phones do not have user-friendly functionality.
- Access to printers and scanners does not meet the current requirements of users.
- Needed equipment is not available. Such needed equipment includes:
  - Laptops
  - Overhead projection devices utilizing emerging technologies, such as infrared capability
  - Color printers
  - CD-ROM capability
- FAX machines are not integrated into the system. They are not easily available, and there is no FAX modem on the network.

As a result: On the campuses, it is becoming increasingly difficult to support a very diverse environment. Without common high speed networking capability for voice, video and data, the colleges will not be able to participate and compete in distance learning and other projects being proposed throughout the state.

Campuses are installing networks independently. This is not cost-effective, either in terms of consultation costs or equipment costs. New applications cannot be installed in the client server mode because of the lack of a high-speed Wide Area Network (WAN), which supports modern protocols between colleges, and the lack of LANs within colleges.

At the System Office, inefficiency occurs as staff spend time searching for phone backup. Phones may remain unanswered, or calls may be redirected multiple times, resulting in a poor public relations image. People are unable to exhibit leadership through the use of technology to provide quality presentations.

3. ***It is difficult to respond to federal, state and local authorities' requirements for evidence that educational institutions are accountable, customer-driven, measurable, and responsive.***

The System Office is responsible for gathering and analyzing data and presenting it in a user-friendly way to the public. However, current administrative systems were designed as data processing systems and tracking capability is primarily limited to financial and student enrollment information, rather than the student-centered information required today. With such limited systems, the System Office is currently finding it difficult to implement comprehensive student tracking.

This problem is further complicated by difficulty in: collecting needed data; reconciling current information with other databases; accessing databases due to privacy issues; and verifying previously collected data. Furthermore, North Carolina State Board of Community Colleges policy, recognizing local college autonomy in the collection, storage and retrieval of student data, conflicts with increasing legislative reporting requirements for data. It is anticipated that the General Assembly will mandate more and more tracking requirements, causing increasing problems for individual colleges and the system as a whole.

Beyond the autonomy issues, there also are serious concerns about the accuracy of data, the lack of consistency in some data element definitions across colleges, and the adequacy of historical databases. Historical databases are on tapes and are difficult for end-users to access and analyze. Therefore, many end-users rely on programmers, and dependence on programmers discourages the iterative process required for good data analysis.

As a result: It is not easy for System Office staff or college staff to answer the many questions being posed. Therefore, time is not being spent on more complex analyses, good outcome measurement is not available, and current reports are accompanied by many qualifiers.

4. ***The fixed level of resources available in the Information Services Section is insufficient to provide adequate support for the IIPS, thus making it difficult to bring on essential new functions.***

At the current time, approximately 85 percent of Information Services' programming resources are utilized to support the statewide administrative systems (IIPS). At the same time, there is a five-year backlog of requests for needed modifications to the system and required new applications. The movement from the single PRIME system to three UNIX vendors will further increase support requirements.

Although moving the administrative systems into more easily supported formats would reduce the resources needed for maintenance, there are no resources available to migrate the system. Furthermore, desired new functions and capability that would permit end-users and/or local college support services to absorb some of the responsibility for their own information needs (and thus reduce System Office support requirements) cannot be implemented. Such end-user tools, which would reduce the support requirements of the local colleges, include:

- SQL compliant databases[3]
- Editing tools
- Data access tools
- User-based information analysis tools
- GUI front ends

As a result: Information Services is unable to meet current demands being placed on it. The backlog is expected to continue to increase as the need for new and better information continues, and the maintenance requirements will increase with each modification. Furthermore, substantial modifications will be required by anticipated mandated changes from state and federal legislation and the current reengineering program. Therefore, it can be anticipated that Information Services, without intervention, will continue to be unable to meet expectations.

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[3] Grant Thornton. North Carolina Department of Community Colleges Management Support System Needs Assessment Report, June 1988.
Center for Urban Affairs and Community Services, North Carolina State University. Management Support System Design Project Report, September, 1989.

5. ***Technology is not being used as efficiently and effectively as it could be since many users are inadequately informed about what it can do and how to use it.***

System Office staff identified training as a major need on the surveys and mentioned it as a concern in all of the interview sessions. Training also was identified as a primary concern by all of the college personnel who were interviewed.

While past training efforts of the System Office were praised, there are current needs for additional types of training. These include: PC applications; network management; high level functions; trends and directions; and reviews of currently available applications that would save time and/or improve quality.

Limited resources, the rapid pace of technology development, and the lack of prioritization from leadership have restricted the ability of the System Office to take a proactive role in showing end-users the value of information technology in a number of areas, including: instructional technology; research; and some functional areas.

Furthermore, current classes are not meeting System Office staff needs, including: time offered; place offered; supervisors' support; prior publicity; and medium used (e.g., on-line, video, books). There is no common level of expected skill for all employees and very little higher level training.

As a result: System Office staff may be doing old things with new tools, rather than changing their approach, and staff do not have the ability to utilize new technologies to change the way business is done, either in the classroom to enhance the teaching/learning process or in the office to increase efficiency.

VISION STATEMENT

The North Carolina State Board of Community Colleges and the System Office will continue to champion the 58 community colleges and CATT by:

- Providing and articulating visionary state-level leadership.
- Serving as the colleges' advocate to the legislative and executive branches of government.
- Assisting the colleges in meeting regulatory and accountability requirements.
- Establishing or facilitating collaborative partnerships for the delivery of educational services to individuals, businesses, and communities.

It is recognized that this vision extends to technology and that the effective attainment of this vision can be impacted by the application of technology to enhance or enable human communication, understanding, and knowledge development.

Enabling Assumptions

It is assumed that the following will occur:

1) Community colleges will be the primary deliverers of instruction for the work force.
2) Community colleges will help shape the economic viability of our communities.
3) There will be adequate access to technology across the state of North Carolina.
4) The community college will be the focal point of lifelong learning.
5) The community college will be the educational and technical bridge from the public schools to the "world of work" and/or four-year institutions.
6) The community colleges will be able to serve special populations using technology (e.g., homebound, senior citizens, prisoners, non-English speaking students, and physically and mentally challenged students).
7) The system will have resources available to implement and support its information technology infrastructure.
8) Faculty, staff and students will have an understanding of how to apply technology to accomplish their tasks.
9) Training will be recognized as a necessity and adequately funded.
10) There will be seamless connectivity across the state for voice, video and data.
11) Technology, expanding and blurring the geographic boundaries of the colleges, will facilitate market segmentation.
12) Community colleges will respond to the growing competition from the private sector.

13) The growth of non-traditional delivery will be exponential and will be integrated with traditional campus-based programs.

14) The role of the teacher will change dramatically from the traditional role of dispenser of knowledge to the manager of learning resources and facilitator of learning.

15) "Just-in-time learning" and "just-in-time training" will increase and change expectations.

16) Community colleges will be expected to take a leadership role in managing the sociological results of these changes because of their close role with the community.

17) The colleges will continue to expect the System Office to provide services that are more cost effective when done collaboratively.

RECOMMENDATIONS

In order to provide full access to, support for, and training for using information technologies in order to live and work in an information society; to allow the system to consider ways in which technology can be utilized to provide more efficient and cost-effective operations; and to provide better information on which to base decisions, the following recommendations are proposed.

1. ***Planning***

1.1. Establish a system-wide approach to technology as a priority.

Action Steps

1.1.1. Get agreement from the North Carolina Board of Community Colleges.

1.1.2. Get agreement from the Presidents' Association.

1.2. Provide leadership for the development of a statewide five-year plan for information technology, with a time frame, that will:

- Outline the responsibilities of the colleges, including:
  - Providing access to technology for students, faculty, and staff.
  - Developing organizational structure for technology that identifies who is responsible for voice, video and data; training; and Internet and database access.
- Outline the responsibilities of the System Office.
- Identify appropriate standards, (e.g., hardware, software, security, networking, data transfer) and the timeframe during which they will be supported.
- Identify appropriate Board-level policies and procedures to support the efficient delivery of services and develop an appropriate funding strategy.

Action Steps

1.2.1. Appoint a Technology Advisory Committee[4], representing both administrative and instructional interests of the colleges.

1.2.2. Develop the plan.

1.2.3. Market the plan.

[4] See Appendix B

Expected Outcomes

- Information technology will be a priority.
- The System will share a common goal for the use of information technology.
- The colleges will be able to develop their own plans for information technology with an understanding of the resources that will be available to them.
- There will be a set of standards to guide colleges in the implementation of information technology.
- There will be raised levels of awareness about the importance of information technology in the teaching/learning process.

2. *Holistic Approach to Technology*

2.1. Integrate responsibility for voice, video and data

Action Steps

2.1.1. Place the current Information Services, Library Services, and Telecommunications Sections in the same division, while maintaining close relationships with Academic Services to facilitate the coordination of voice, video and data.

2.1.2. Acquire networking expertise at the System Office[5].

2.1.3. Expand the charge of Library Services to reflect the changing role of the library[6], including:

- Identifying, monitoring and negotiating for state-wide, cost-effective database access.
- Acquiring statewide licenses for CD-ROMs, on-line serials, etc.
- Providing services that some colleges may not be able to afford, such as digitizing reserve room materials.
- Maintaining a text-based resource (e.g., CD-ROM) library on the network.
- Coordinating training/access for Internet usage across the System[7].

[5] See Appendix B
[6] See Appendix B

2.1.4. Expand the charge of the System Office to include support for instructional technology, including:

- Providing the infrastructure for the delivery of instructional materials (e.g., networks, servers, bulletin boards, conferencing capability)
- Supporting the development of instructional materials and programs by:
  - Coordinating the development of multimedia-based curriculum to leverage resources across the community college system.
  - Coordinating training on the use of development tools, design of curriculum materials, and presentation guidelines.
  - Coordinating development of distance learning.
- Resolving policy issues.

2.2. Provide tools for the System Office staff to enhance their efficiencies.

Action Steps

2.2.1. Install phone mail.

2.2.2. Provide a Fax modem on the System Office local area network.

2.2.3. Provide presentation tools.

Expected Outcomes

- The system will address voice, video and data requirements from a common perspective.
- The colleges will be able to implement networks more cost-effectively.
- The colleges will have access to a broad range of resources.
- The implementation of instructional technology will be cost-effective statewide.
- The System will be able to present economies of scale and consistency to the state agencies providing networking services.
- The System Office will be more responsive to the colleges.

[7] Valaukas, Edward J., "The Rebirth of Librarianship: Internet as Opportunity," Minnesota Libraries, Vol. XXX (Office of Library Development and Services, Minnesota Department of Education , Autumn-Winter 1993/1994, Number 9/10), p. 166.

3. ***Data Access***

3.1. Ensure that data collection systems, procedures, and processes support planning and accountability efforts[8] for both the colleges and the System Office.

Action Steps

3.1.1. Place the responsibility for accountability measures in the Office of Planning and Research.

3.1.2. Appoint a Data Committee[9].

3.1.3. Analyze and coordinate current data collection to:

- Identify types of data that will be required for assessment and accountability.
- Identify mechanisms for collecting these data.
- Identify methods to verify data that are being collected.

3.2. Facilitate, in so far as possible, the linkage of public and private databases that identify outcomes.

Action Steps

3.2.1. Identify measurements that require data.

3.2.2. Identify needed databases.

3.2.3. Build links with universities, private colleges, and public schools.

3.2.4. Work with State Occupational Information Coordinating Committee (SOICC) to obtain required data.

3.2.5. Work with other groups, where possible, to negotiate access to required data.

3.3. Facilitate access to state level data for all end-users.

Action Steps

[8] Commission on the Future of the North Carolina Community College System, Gaining the Competitive Edge: The Challenge to North Carolina's Community Colleges, February, 1989.

[9] See Appendix B

3.3.1. Develop an institutional research database that is available to the System Office staff and to the colleges. This database should be SQL compliant, be located on the network, and be accessed by standard tools identified by the 5-year plan.

3.4. Expand and enhance IIPS to support student tracking.

Action Steps

3.4.1. Revisit the Student Progress Monitoring System[10] and make the accommodations necessary to implement it.

Expected Outcomes

- The system will be able to provide better information to all of its clients.
- The system will have better information to improve programs, to provide better services and to make better decisions.
- Data collection and analysis will be more efficient and more accurate.

4. ***Administrative Systems***

4.1. Reassess the direction and design of the IIPS application software development program to provide the most effective way to migrate the applications to, and maintain the applications in, an open, distributed, SQL compliant, network-centric environment with all requested improvements.

Action Steps

4.1.1. Conduct an independent study to identify the most effective way to provide enhanced administrative information systems for the 58 community colleges and CATT.

4.1.2. Appoint a committee to evaluate the results of the study and recommend a course of action.

4.1.3. Make required changes to other application systems, including those in the colleges that interface with the statewide system.

[10] Commission on the Future of the North Carolina Community College System, Gaining the Competitive Edge: The Challenge to North Carolina's Community Colleges, February, 1989.

4.1.4. Propose policies that require that all purchased packages that will interface with the administrative systems are compatible.

4.2 Provide increased interim support for Information Services.

Action Steps

4.2.1. Identify internal resources that may be reassigned.

4.2.2. Use external resources as appropriate.

Expected Outcomes

- Effective application development
- Effective application maintenance and support
- Enhanced applications resulting in enhanced functionality for the system.
- Enhanced capability for the end-users

5. *Training*

5.1. Broaden the scope of the Personnel Office at the System Office to include Human Resource Development responsibilities, such as coordinating staff training.

Action Steps

5.1.1. Appoint a coordinator for System Office staff training in the Personnel Office.

5.1.2. Establish a base-level of technical skill required for all staff.

5.1.3. Identify training required, develop a training plan, and implement the plan.

5.2. Revise System Office job descriptions and include required skills in personnel performance plans.

Action Steps

5.2.1. Identify the skills required across the System Office, develop a training plan, and implement the plan.

5.2.2. Work with each employee to identify specific skills needed and develop a personal training plan.

5.3. Provide specialized training for the system.

Action Steps

5.3.1. Establish an Information Technology Training Center, that will be available to the public as well as technical staff, to provide training for college and System Office technical staff on emerging information technologies.

5.3.2. Develop a plan to coordinate training and support for PC applications across the community college system.

Expected Outcomes

- System Office staff will be better trained.
- System technical staff will have enhanced skills.
- System Office staff will be more efficient and more effective.
- New and emerging technologies will be more effectively utilized.

GLOSSARY

Application - The use of a computer for a specific purpose, such as writing a novel, issuing paychecks or registering a student.

Architecture - The physical structure or design of a system and its components, from the operating structure to the programs that make it run.

Bridge - In local area networks, a device that allows two networks (even ones dissimilar in topology, wiring, or communications protocols) to exchange data.

Bulletin Board - A telecommunications utility, usually set up for a group of people with a common interest.

CD-ROM - Acronym for *compact disc-read only memory*, a read-only optical storage technology that uses compact disks.

Client - In a network, a workstation with processing capabilities, such as a personal computer, that can request information or applications from the network server.

Client/Server Architecture - A design model for applications running on a network, in which the bulk of the back-end processing, such as performing a physical search of a database, takes place on a server. The front-end processing, which involves communicating with the user, is handled by smaller programs distributed to the client workstations.

Courseware - Software that integrates technology into the subject matter of the curriculum.

E-mail - A messaging system which allows users to exchange text and correspondence via a network.

Fiber Optics - A data transmission medium that carries light pulses over glass cables. Fiber has the capability to transfer digital information at 100 Mbps today and at significantly higher speeds in the future.

Format - The arrangement of information for storage, printing or displaying.

Gateway - A computer system and its software that allows two networks using different protocols to communicate. Gateways can also be used to restrict the kind of information that can pass between networks.

Graphical User Interface (GUI) - A design for the part of a program that interacts with the user and uses icons to represent program features.

Homepage - A defined set of rescues on Internet and a pathway to get to them.

Hypermedia - A computer-assisted instructional application that is used to add graphics, sound, video, and synthesized voice to the capabilities of a hypertext system.

Hypertext - The non-sequential retrieval of a document's text. In a true hypertext application, you can highlight virtually any word in a document and immediately jump to other documents containing related text. Commands are available to create your own associative trails through the document.

Integrated Services Digital Network (ISDN) - A network that offers end-users voice and data on end-to-end digital circuits.

Interactive Video - A computer-assisted instruction technology that uses a computer to provide access to video information stored on a video disk.

Internet - A system of linked computer networks, worldwide in scope, that facilitates communication services such as remote login, file transfer, electronic mail, and newsgroups.

Legacy Systems - Existing application programs that need to be linked to new application programs.

Local Area Network - Personal and other computers within a limited area that are linked by high-performance cables so that users can exchange information, share peripherals, and draw on programs and data stored in a dedicated computer called a file server.

Memory - The computer's primary storage, as distinguished from its secondary storage, such as disk drives.

Middleware - A variety of different methods of establishing communications between client applications and the server.

Modular programming - A programming style that breaks down program functions into modules, each of which accomplishes one function and contains all the codes and variables needed to accomplish that function.

Multimedia - A computer-based method of presenting information by using more that one medium of communication, such as text, graphics and sound, and emphasizing interactivity.

Network-centric - A concept whereby resources are located on the network rather than on a mainframe.

Object-oriented Programming Language - A non-procedural programming language in which program elements are conceptualized as objects that can pass messages to each other. In object-oriented programming, the modules are independent enough to stand on their own, so they can be copied into other programs.

On-line - Directly connected with and accessible to a computer,

Open Systems - Vendor hardware and software systems that incorporate industry standards allowing products from different vendors to work together.

Operating System - A master control program for a computer that manages the computer's internal functions and provides a means to control the computer's operations.

Platform - A computer hardware standard, such as IBM-compatible or Macintosh.

Portability - The ability to run an application on computers from different vendors with minimal changes to the application.

Relational Database - A database in which a table defines the relation between the items listed in rows (data records) and columns (data fields), treats all data as tables and presents the result of any query as a new table.

Router - Connects local area networks that use identical protocols. A router can detect which of several paths network traffic will follow.

Scaleable - Can be enlarged or reduced without introducing distortions.

Server - In a network, a computer that stores the application programs and data files for the workstations on the network.

Storage - The retention of program instructions and data within the computer so that this information is available for processing purposes.

Test Beds - A system that allows duplication and resolution of problems.

Transmission Control Protocol/Internet Protocol (TCP/IP) - A set of standards for communication between computers linked to Internet.

Value Added Network - A network service that provides additional function beyond basic transmission, such as electronic data interchange, electronic mail, Internet access, and network operational support.

Virtual Reality - A computer system that can immerse the user in the illusion of a computer-generated world and permit the user to navigate through this world at will.

Wide Area Network - A computer network that uses high-speed long-distance communications networks or satellites to connect computers over distances greater than those traversed by local area networks.

Workstation - A desktop computer that runs application programs and serves as an access point to the network.

World Wide Web (WWW) - A system for organizing and accessing documents and other Internet resources via hypertext and hypermedia links. A client software program that is used to explore the Internet, locating resources stored on World Wide Web servers.

APPENDIX A - CURRENT SYSTEMS

Administrative Systems Currently Supported by Information Services

System	Description	Comments	Date Implemented
Institutional Staff Information System	Provides state-wide information on staff patterns, salaries, and demographics of faculty ad staff.		1984
Student Information System	A variety of system modules that cover the functions of student enrollment management, from application through graduation, including demographics for curriculum and extension programs.		1978
Institutional Class Report	Provides the basis for computing the Full Time Equivalent (FTE) enrollment for each institution and for developing system total FTE. Also used to determine statistical information about classes. There are separate systems for curriculum and extension.		1980
General Education Development	Collects information on each GED student including demographics, testing center, and test scores. Used to process GED certificates and for reporting.		1982
Human Resource Development	Provides enrollment and follow-up information on each HRD student.		1983
Curriculum Student Progress Information System (CSPIS)	Provides annual summary information on status of students enrolled in prior year.		1990
Student Follow-up Information system	Integration of existing internal databases and external databases to gather and analyze program assessment information.		1993
College Equipment Inventory System	System-wide inventory system which includes a bar-code option.		1982
College Financial Management Systems	Major financial management tools, including general ledger, accounts payable, accounts receivable, payroll.		1980
JTPA Systems	Management system for JPTA grants to colleges.		1986
Integrated Post-secondary Education Data Systems	Annual institutional summary information for US Department of Education.		1984
North Carolina Higher Education Data System	Annual institutional summary information for University of North Carolina General Administration.		1977
Institutional Facilities Utilization Information Systems	Used to develop an annual higher education facilities utilization study prepared by the UNC-GA.		1982
Literacy Education Information	Provides tracking capability and summary reports on literacy		1992

System	Description	Comments	Date Implemented
System	students.		
Scheduling/management System	Enables the scheduling and management of campus facilities.	In progress	1995
Student Progress Data Facilities	A module in the CSPIS that enables college staff to analyze the status of a student's transcript with respect to curriculum program requirements.		1992
Telephone Registration	Integrated into the IIPS.	In trial	1995
Electronic Transcript Interchange	Enables the electronic transfer of transcripts to and from colleges and external sources.		1996
Bookstore Management System		RFP in progress	
Curriculum Common Course Library Management System		In progress	

APPENDIX B - JOB DESCRIPTIONS AND COMMITTEE CHARGES

The Future: North Carolina Community College Libraries in the 21st Century

In a college without walls, the library is the heart of the college. Skill patterns developed during a 2,000 year history of meeting the needs of students and faculty have prepared librarians to take the lead in utilizing technologies and providing support for major paradigm shifts in education and society. These skills include a strong service philosophy, organization, interpretation, evaluation and re-allocation of resources.

Of most importance are the quality, relevance, accessibility, availability and delivery of resources and services needed by students and faculty regardless of location. The library must support critical and independent thinking for students and faculty in a rapidly changing information based society.

Service demanded by the constantly changing skills of the workplace as well as the standards set in elementary schools for computer literacy by the third grade mean that students will approach higher education with skills far beyond those of the 20th century. The community college library must be forward thinking in its approach to service and open to moderating traditional services with new approaches to meeting the needs of existing and future students.

Community college staff must be competent, credentialed, and empowered to meet the increased responsibility of an information based world.[11] There must be on-going training to update staff skills and knowledges.

Therefore, at the System Office, staff will need a visionary service philosophy in their approach to statewide leadership. This staff will need to focus not only on method, but also on approaches to service. Desirable attitudes are leadership, coordination, advocacy, knowledgeable approach to resources, and opportunities to participate in new initiatives and projects. The ability to work with the 58 community college and CATT librarians and related library associations is imperative.

With a well equipped, highly qualified staff, they need to:

- See the possibilities of new methods and services.
- Be an advocate for new approaches within the System Office and throughout the System.
- Provide leadership in developing a team approach for cooperation and communication among librarians.
- Be flexible in their view of traditional services.
- Provide centralized training and skill building.
- Model use of new technologies while staying abreast of the changing technical environment.
- Be a positive spokesperson for community college libraries.
- Communicate the successful ideas of librarians throughout the System.

[11] Commission of the Southern Association of Colleges and Schools, Criteria for Accreditation, Decatur, Georgia: Southern Association of Colleges and Schools, 1995.

- Stay current of changes in local communities for the needs of a viable work force.
- Use and assist librarians through cooperative agreements with vendors.
- Collect annual statistical data and maintain its currency.
- Use and assist local college libraries with the ACRL Standards for Community, Junior and Technical College Learning Resource Programs
- Provide support for regionalization activities.
- Realign existing staff and services to assure efficient and effective delivery of services needed by users.

Networking Expert

Job Specifications

Baseline Criteria

- In-depth understanding of networks
- Broad understanding of the latest technology and its application in the support of information systems in academic and administrative environments
- Experience in a similar environment
- Strong proven leadership ability
- Demonstrated accomplishment in planning for and implementing information systems

Performance Requirements

- Provide ongoing leadership in the use of network information technology for the North Carolina Community College System.
- Provide a vision for the use of network technology in instructional and administrative areas for the college presidents.
- Propose standards, policies and procedures to the Technology Advisory Committee.
- Coordinate planning, evaluation, purchase, installation, and maintenance of computing hardware and software necessary to support the statewide network, including the planning for improvement and development of facilities.
- Serve as a resource person to all colleges in recommending networking hardware and software and other computer-related hardware and software
- Assist in preparation of proposals, as appropriate, for outside funding of information resource facilities.
- Provide staff support for North Carolina Community College System, especially in the area of long- and short-term capital budget projections and assignments.
- Provide project design consultation and project review.
- Coordinate the development, implementation, and maintenance of World Wide Web servers for sharing of text and multimedia resources, conferences and a common bulletin board between colleges.
- Coordinate an evaluation of current college E-mail systems and selection of a common E-mail system or gateway which will facilitate secure and reliable communication between users on the common WAN.
- Staff and manage a System Office network support group capable of providing expert network architecture planning, guidance, and problem resolution assistance that is complementary to college staffs.

- Work with colleges and the network provider to establish service levels.
- Propose system-wide networking standards that will facilitate cost-effective support and the flexibility to incorporate or migrate college networks.
- Work with college network administrators to develop options and common approaches for in-school cabling, including old buildings, sites with asbestos, retrofitting, and new construction.
- Maintain provider and vendor relationships to facilitate effective and timely problem resolution.
- Plan and coordinate network and Internet access for college stakeholders, using appropriate firewalls for security.
- Work with system administrators and/or college network administrators to establish networking policies, standards and procedures for college administrative and instructional networks.
- *Serve as ex officio* member of all appropriate advisory committees.
- Perform other duties as assigned.

Technology Advisory Committee

Sample Charge to Committee

Membership

- Representatives of a wide range of instructional and administrative users of information technology

Charge to Committee

- Develop a plan for technology for the North Carolina Community College System.
- Propose system-wide standards for:
  - Networking for voice, video and data.
  - Security.
  - Workstations.
  - Shared applications.
- Develop a set of priorities for applications in the backlog.
- Review and update the plan for technology annually.

Data Advisory Committee

Sample Charge to Committee

Membership

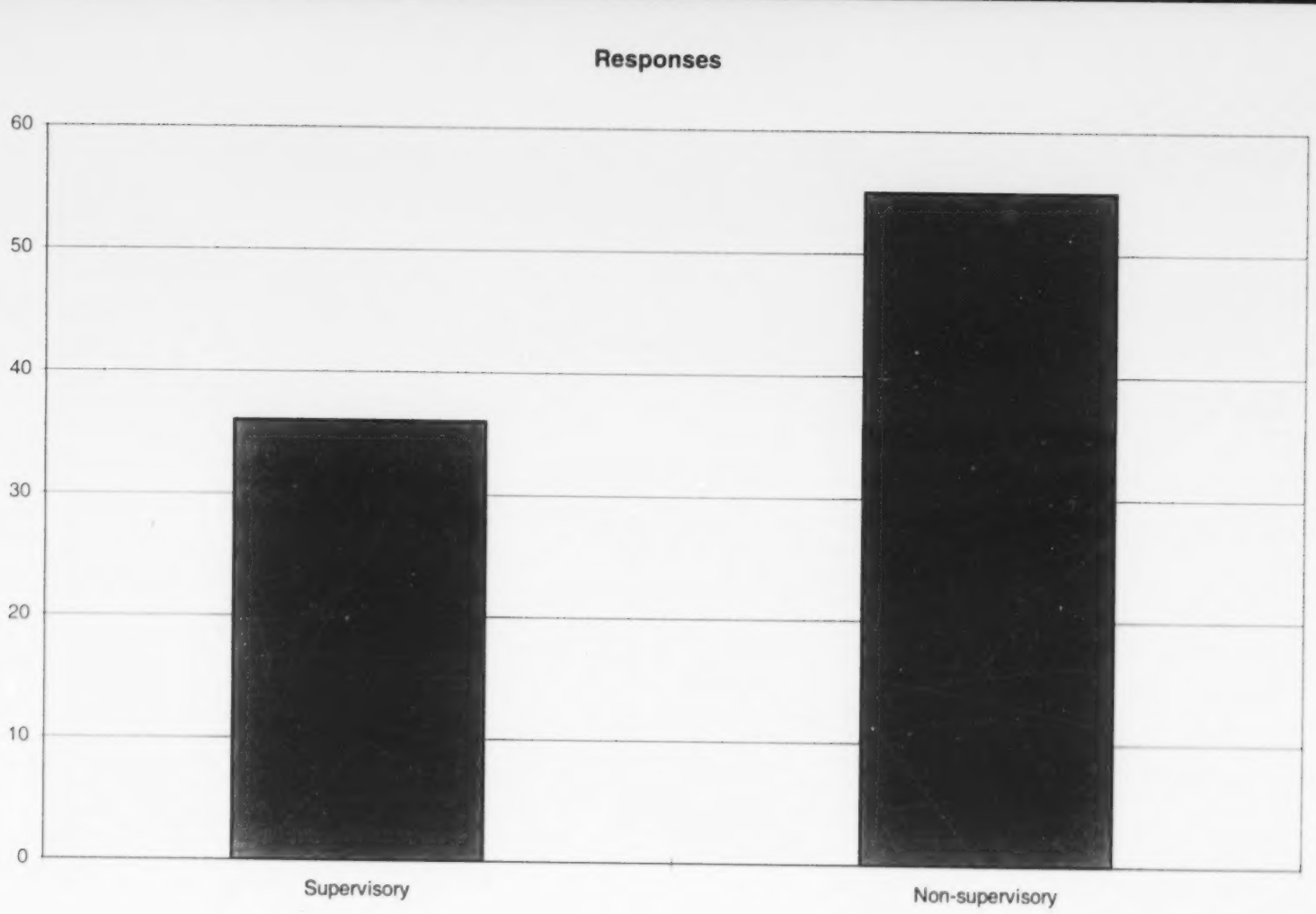
- Representatives from colleges who reflect a broad range of data uses
- Director of Planning - Chairman

Committee Charge

- Identify statewide data requirements.
- Resolve data conflicts between colleges.
- Work with Information Services to identify strategies for downloading, storing, accessing, and archiving data.
- Develop statewide policies, standards, and procedures for data collection and access.
- Work with Information Services to develop a user-friendly Data Dictionary.

APPENDIX C - SURVEYS

NORTH CAROLINA COMMUNITY COLLEGE SYSTEM
INFORMATION PLANNNG STUDY
SURVEY RESULTS



45

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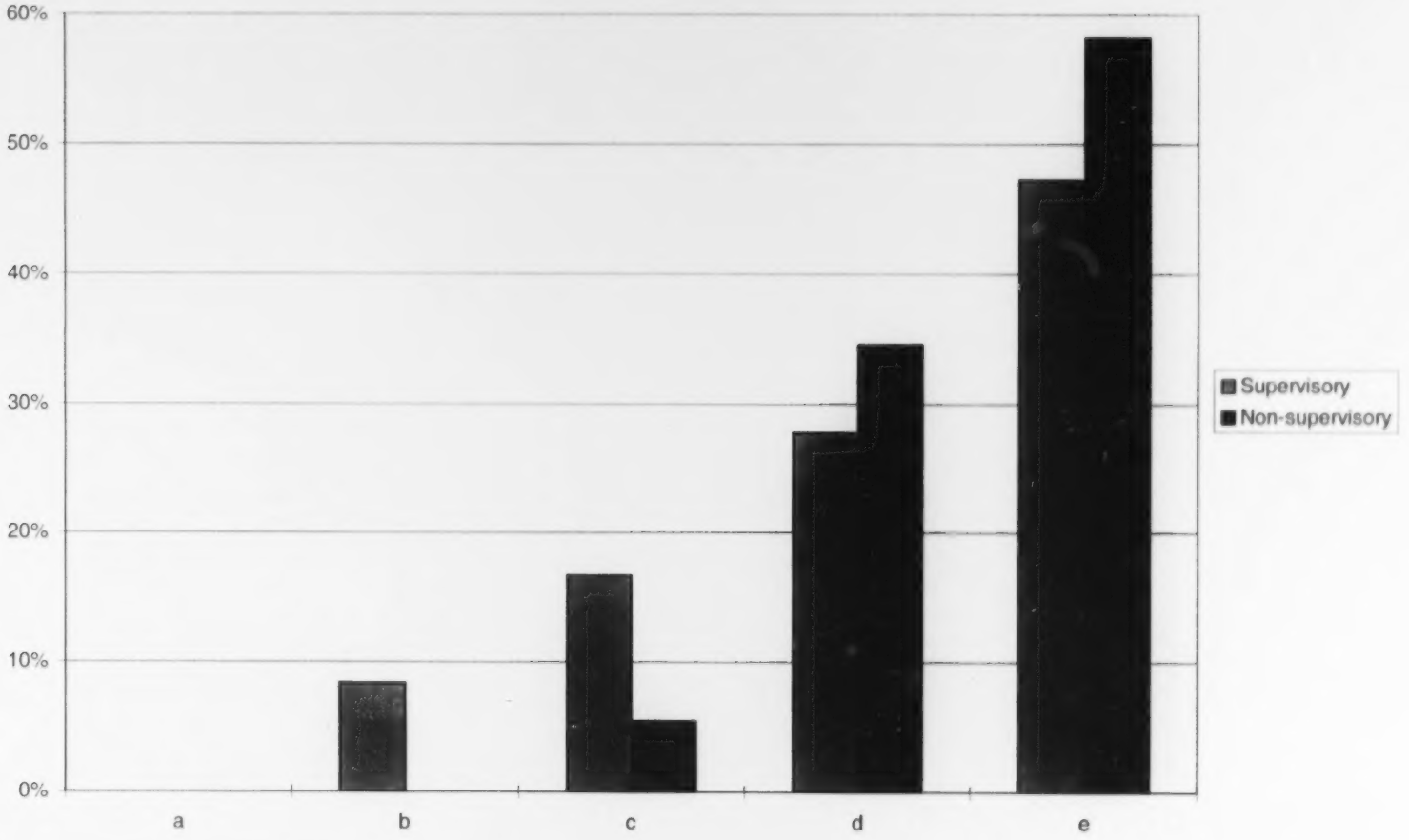
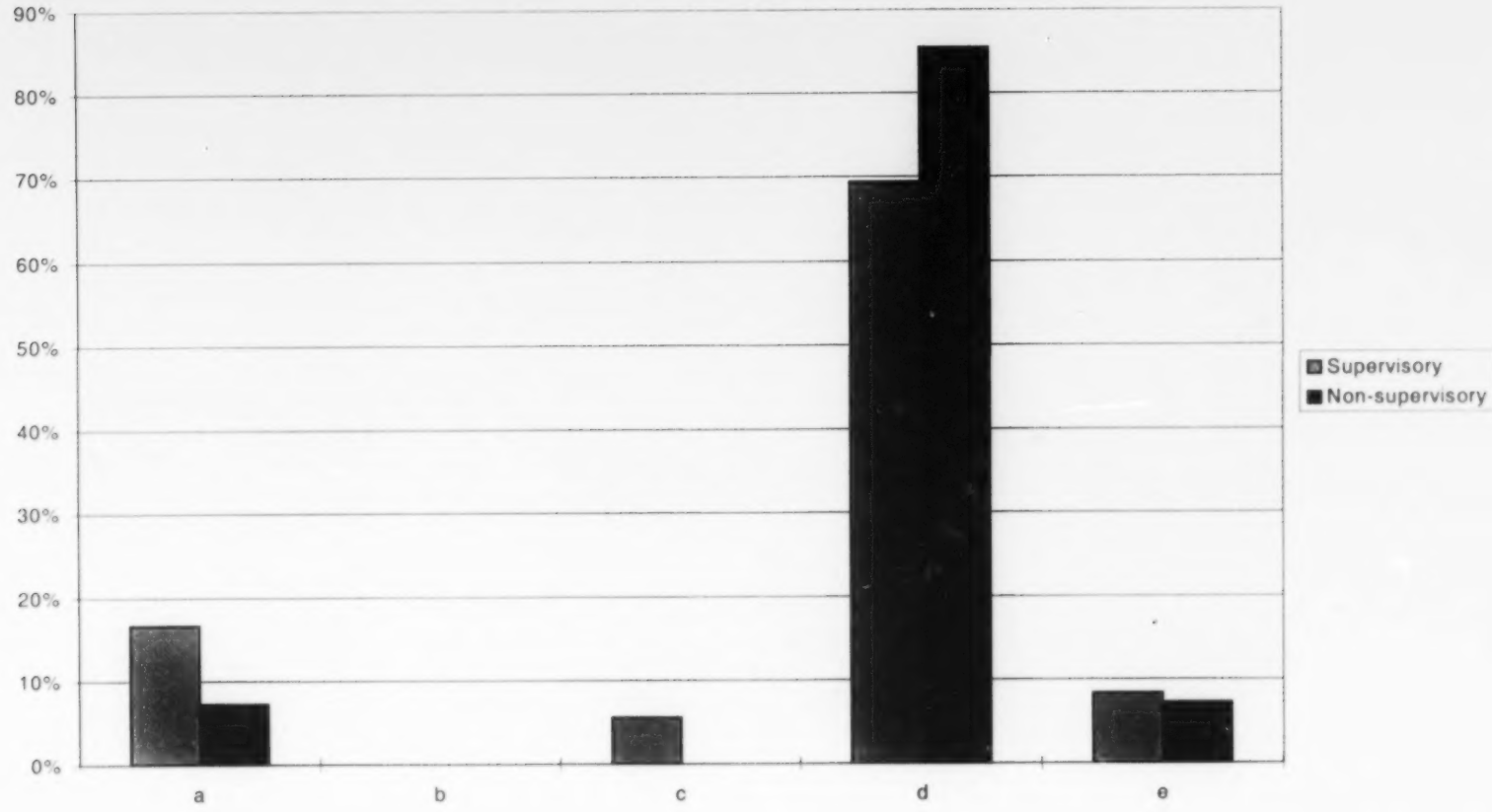
Computer Literacy

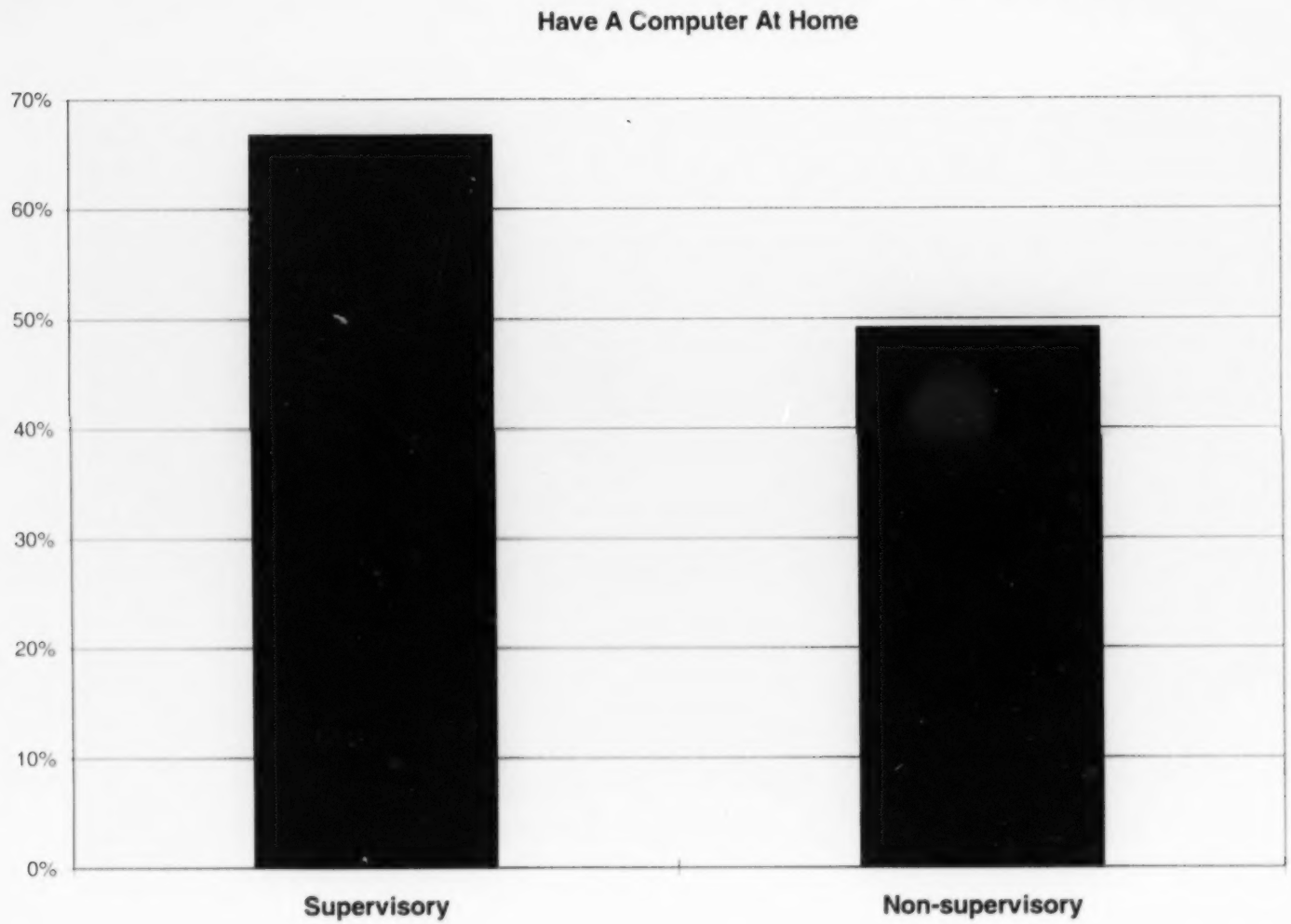


a. I do not use a computer and do not foresee needing to using one in the near future.
b. I do not use a computer now, but I would like to learn how.
c. I use a computer for one application.
d. I use a computer frequently for a variety of tasks.
e. I enjoy trying new programs and modifying them to meet my needs.

Access To A Computer



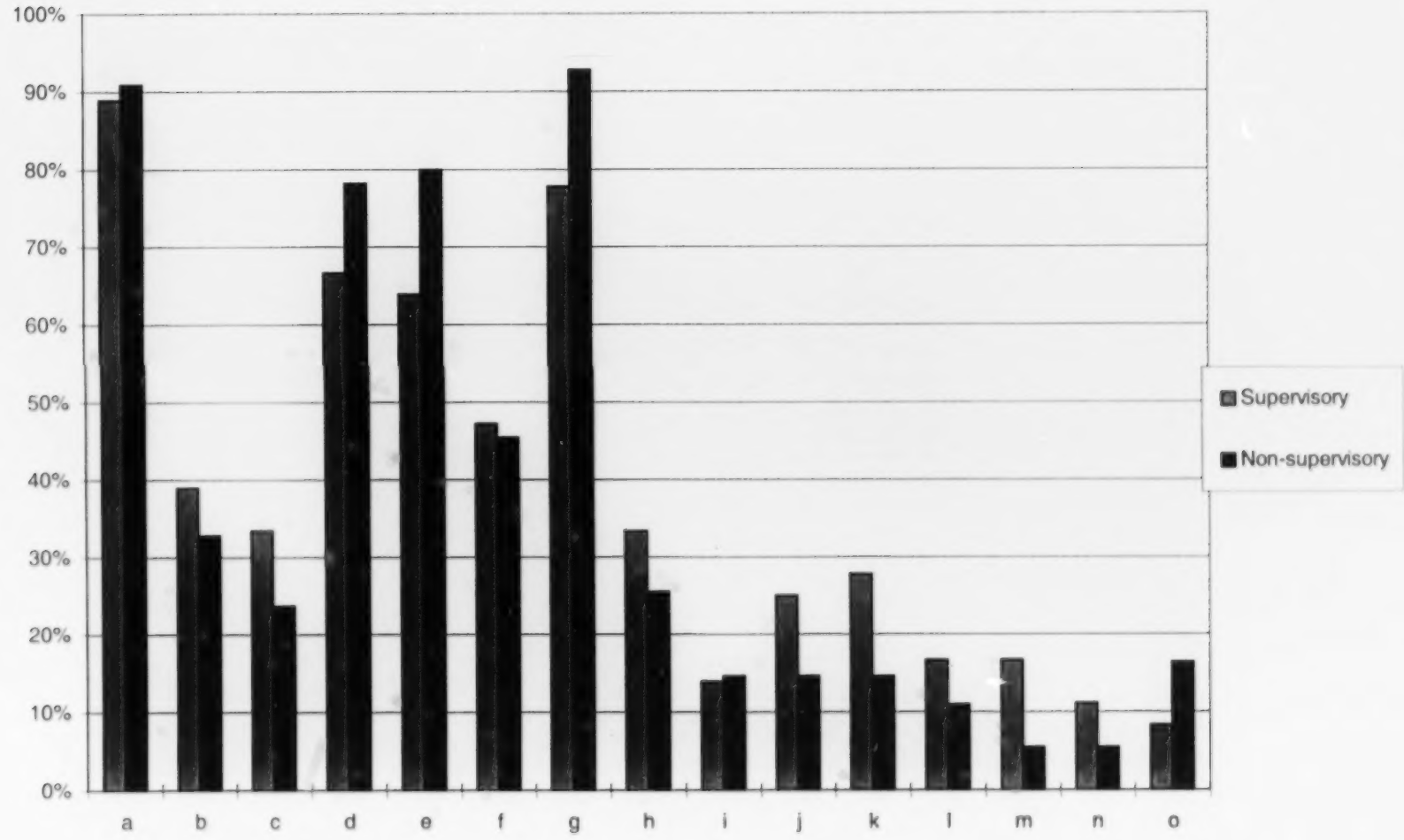
a. A terminal in my office/on my desk.
b. A personal computer/workstation in my office/on my desk.
c. A terminal near my office/desk conveniently accessible to me.
d. A personal computer/workstation near my office/desk and conveniently accessible to me.
e. No convenient access to a computer or terminal.
f. Access to a terminal, but I need a personal computer
g. Access to a personal computer, but I need a UNIX workstation.


Have A Computer At Home
70%
60%
50%
40%
30%
20%
10%
0%
Supervisory
Non-supervisory

51

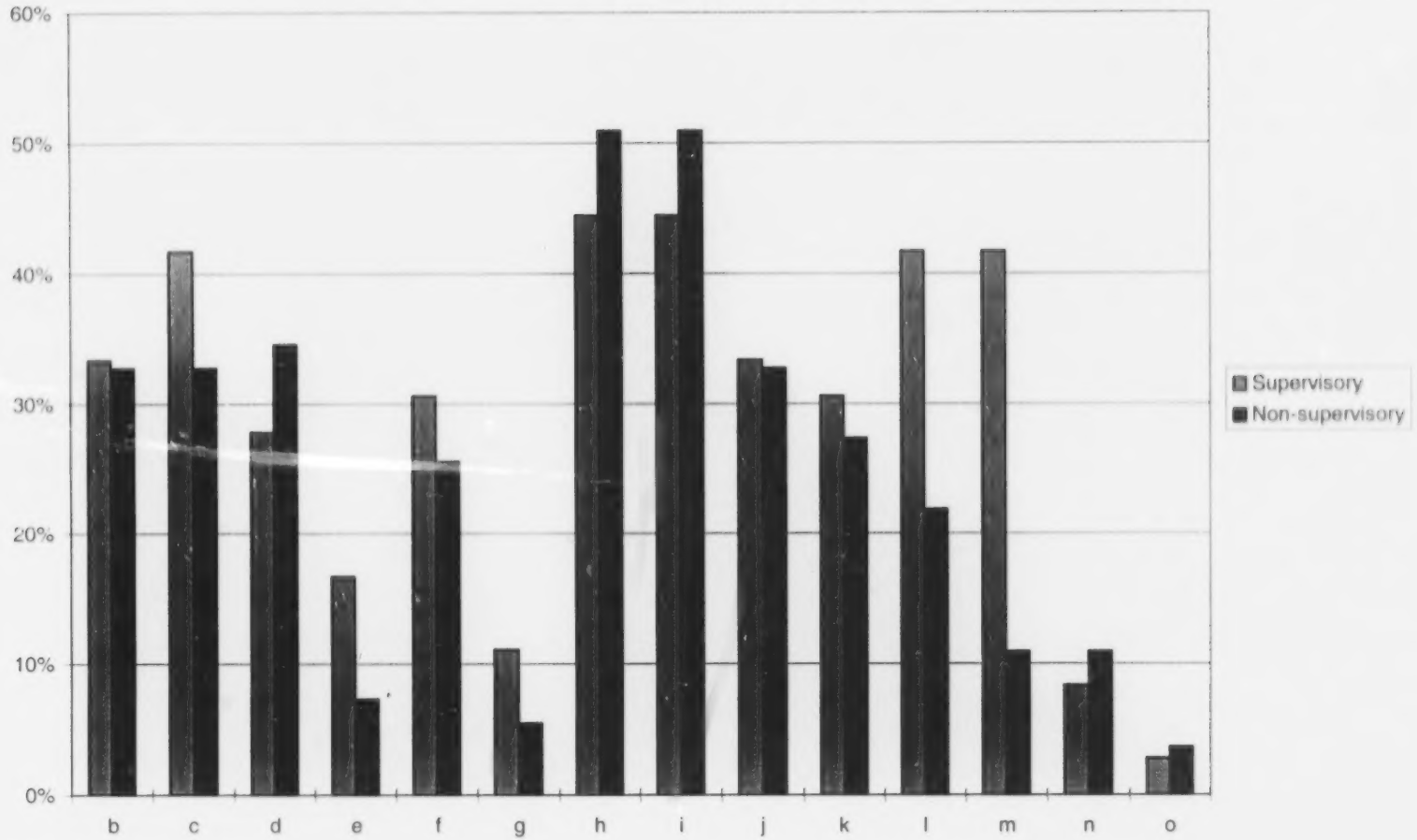
52

Current Uses of Computers



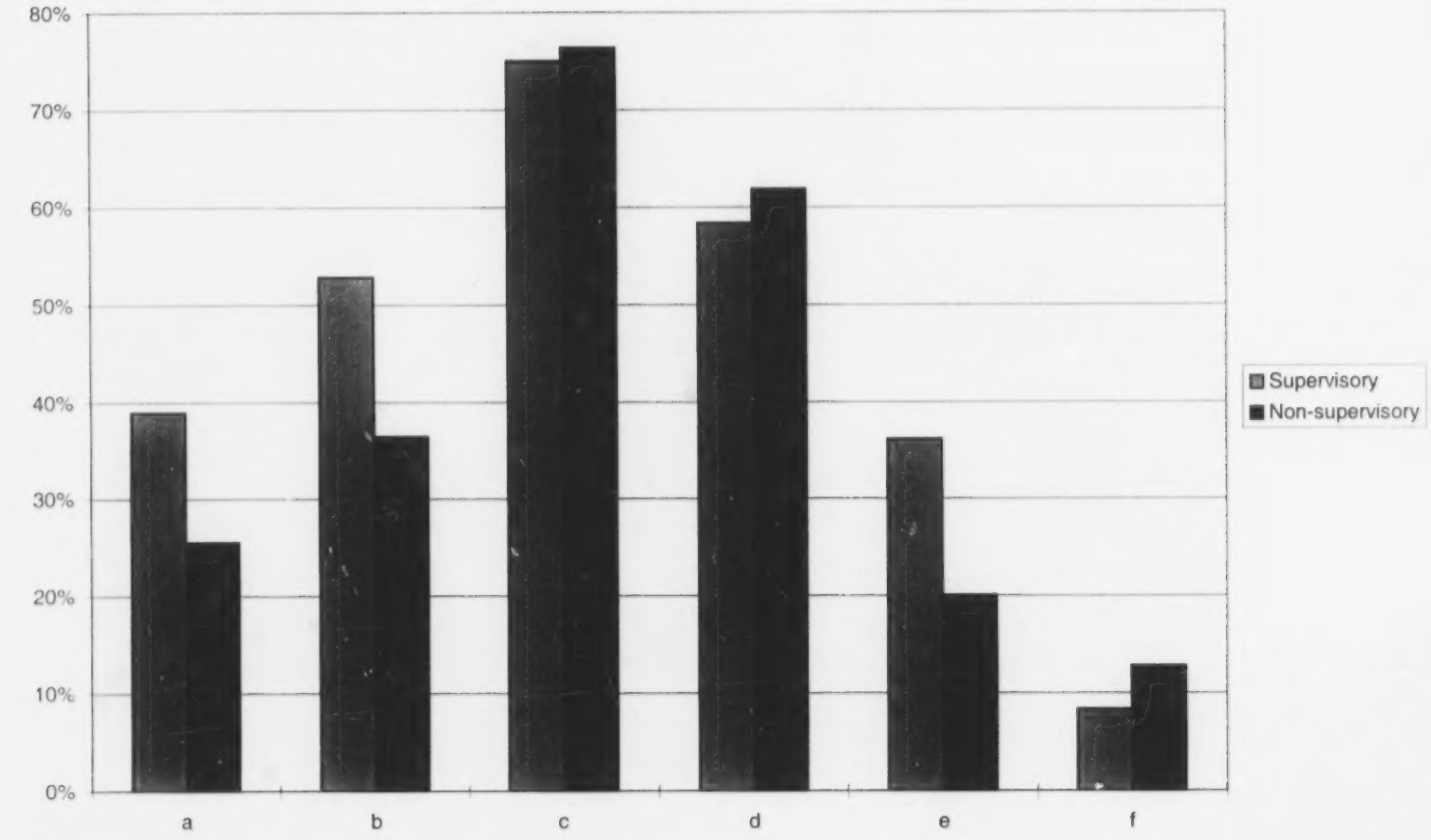
a. Word processing
b. Spreadsheet
c. Database
d. Accessing information on the system
e.. Entering information on the system
f. Communicating to external networks/databases
g. Communicating internally
h. Graphics
i. Desk top publishing
j. Research
k. Library access
l. Statistics
m. Decision support
n. Personal financial affairs
o. Games

Desired Uses of Computers



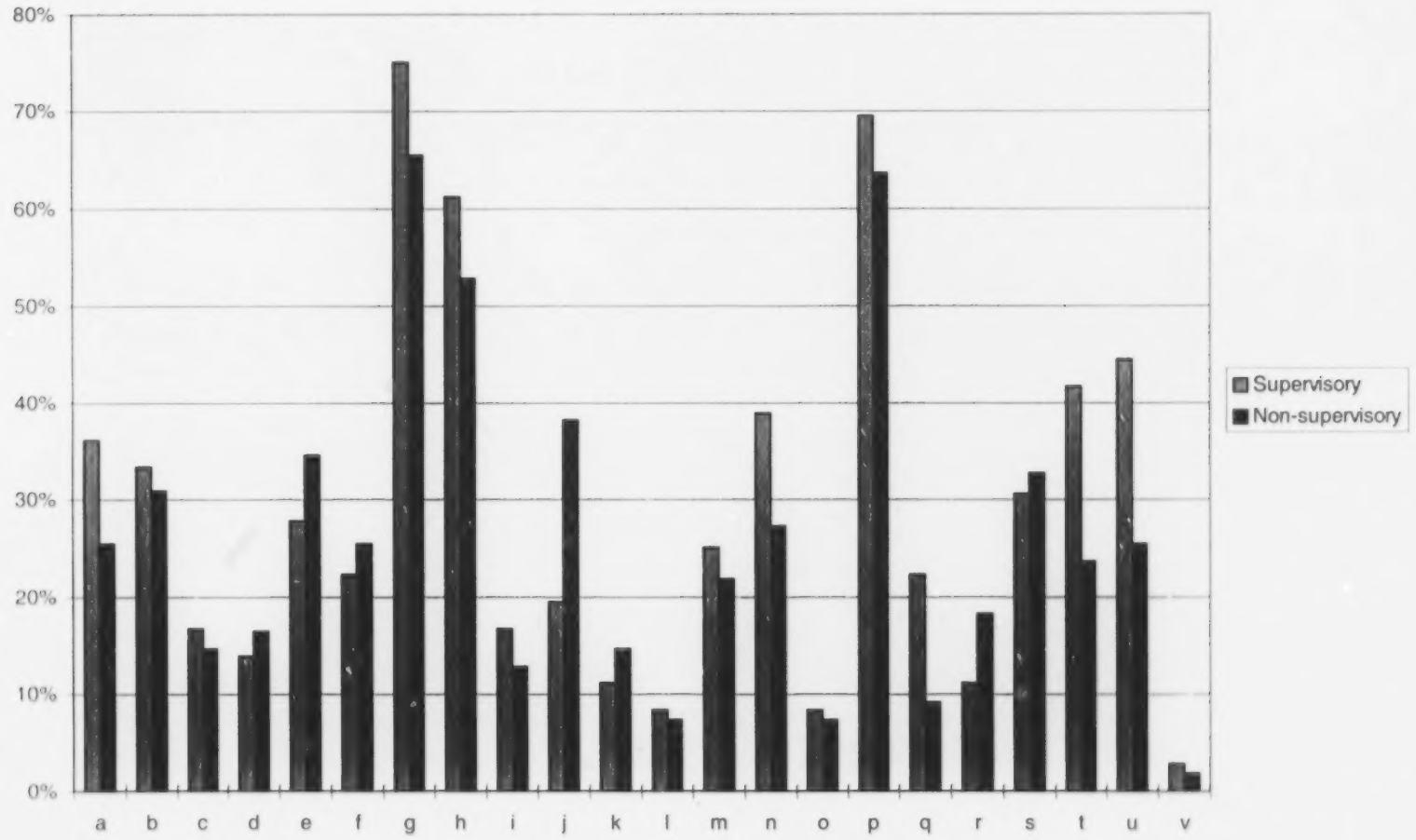
a. Word processing
b. Spreadsheet
c. Database
d. Accessing information on the system
e.. Entering information on the system
f. Communicating to external networks/databases
g. Communicating internally
h. Graphics
i. Desk top publishing
j. Research
k. Library access
l. Statistics

Identified Needs



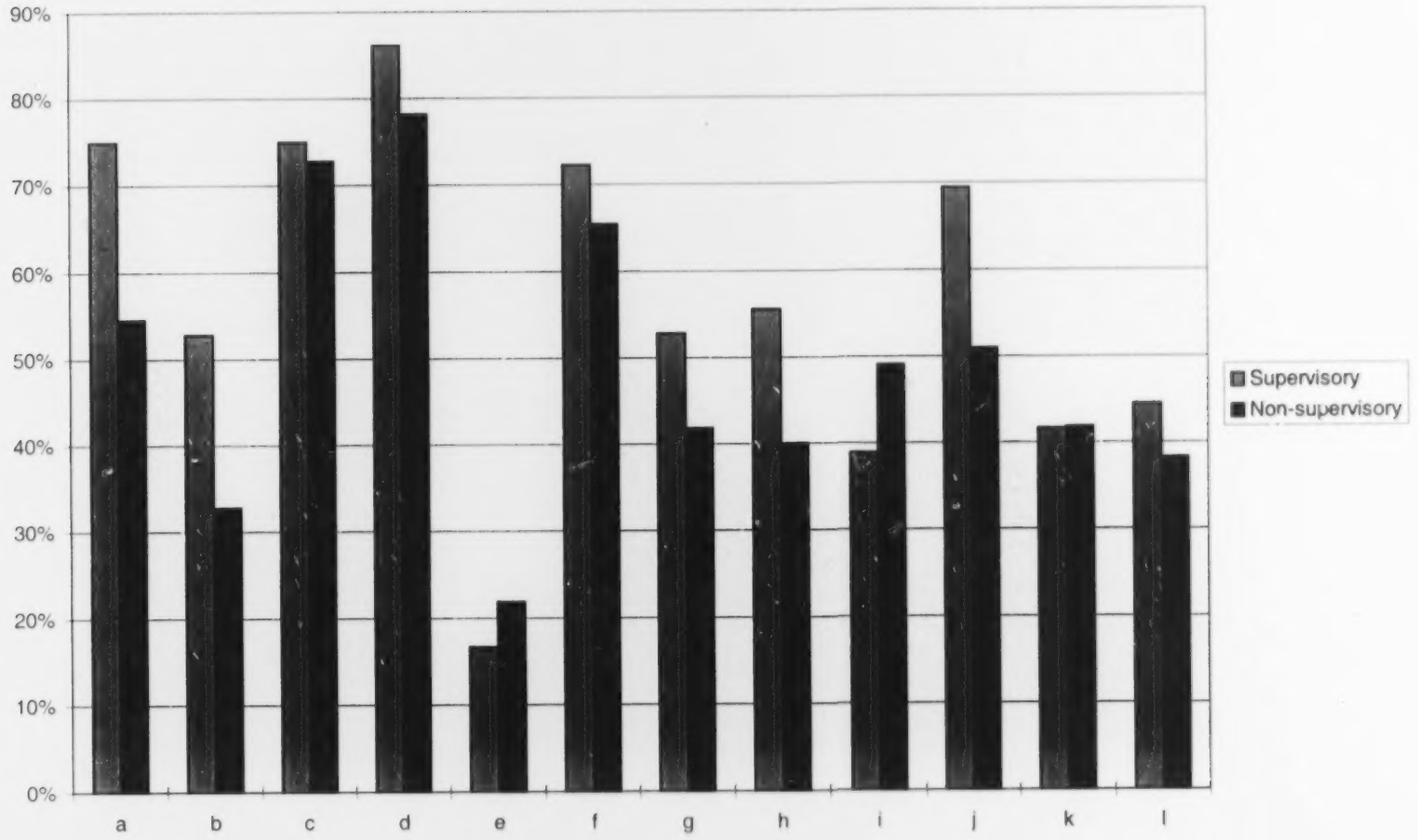
a. Hardware
b. Software
c. Training
d. Support
e. Connectivity (network/modem)
f. Not sure

Major Concerns



a. Maintenance of hardware
b. Maintenance of software
c. Inadequate hardware
d. Inadequate software
e. Printers
f. Policies, procedures and standards
g. Training
h. Support/advise
i. Research resources
j. Instructional resources
k. Security
l. Reports
m. Uploading/downloading
n. Friendliness of systems
o. Library facilities
p. Keeping up with technology/upgrading
q. Accuracy of data
r. Duplication of effort
s. Lack of planning
t. Communications/networking
u. Compatibility of systems
v. Other

Identified Benefits



a. Better information
b. Cost savings
c. Increased job satisfaction
d. Increased efficiency
e. Ability to reassign personnel
f. Saved time
g. Improved quality and quantity of research
h. Better management
i. Improved image of the computer system
j. Improved communications
k. Improved accuracy
l. Increased client satisfaction

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APPENDIX D - COSTS

COST OF IMPLEMENTING RECOMMENDATIONS

Recommendation	Year 1	Year 2	Year 3	Year 4	Year 5
1. ***Planning***					
1.1. Establish a system-wide approach to technology as a priority					
1.1.1. Get agreement from the North Carolina Board of Community Colleges	No cost				
1.1.2 Get agreement from the Presidents	No cost				
1.2. Publish a five-year plan for technology.					
1.2.1. Establish a Technology Advisory Committee representing both administrative and academic interests of the colleges	No cost				
1.2.2. Develop a plan	No cost				
1.2.3. Market the plan	No cost				
2. ***Develop a holistic approach to technology***					
2.1. Integrate responsibility for voice, video and data					

2.1.1.	Place the current Information Services, Library Services, and Telecommunications in the same division	No cost				
2.1.2.	Acquire networking expertise at the System Office	$75,000*	$76,500	$78,000	$79,600	$81,000
2.1.3.	Expand the role of Library Services.	Cost unknown				
2.1.4.	Expand the charge of the System Office to include the support of instructional computing.	Cost unknown				
2.2.	Provide tools for the System Office staff to enhance their efficiency					
2.2.1.	Install phone mail	$25,000	$2,500	$2,500	$2,500	$2,500
2.2.2.	Provide a Fax modem on the local area network	$4,300	$430	$430	$430	$4500
2.2.3.	Provide presentation tools	$36,000**	$3,650	$3,650	$3,650	$36,000
3.	***Data collection***					
3.1.	Ensure that data collection systems, procedures, and processes support planning and accountability efforts for both the colleges and System Office.					

* Equivalent of one position (salary plus fringe benefits)

** 2 LCD projectors, 5 laptops and 1 color printer

3.1.1.	Place the responsibility for accountability measures in the Office of Planning and Research	No cost				
3.1.2.	Appoint a Data Committee	No cost				
3.1.3.	Analyze and coordinate current data collection.	No cost				
3.2.	Facilitate, in so far as possible, the linkage of public and private databases that identify outcomes					
3.2.1.	Identify measurements that require data	No cost				
3.2.2.	Identify needed databases	No cost				
3.2.3.	Build links with Universities, private colleges, public schools	No cost				
3.2.4.	Work with State Occupational Information Coordinating Committee (SOICC)	No cost				
3.2.5.	Work with other groups, where possible, to negotiate access to needed data	No cost				
3.3.	Facilitate access to SIPS data for all end-users					
3.3.1.	Develop an institutional research database	$100,000	$15,000	$15,000	$15,000	$15,000

3.4.	Expand and enhance the statewide administrative system to support student tracking					
3.4.1.	Revisit the student progress monitoring system and make the accomodations necessary to implement it.	Cost unknown				
4.	***Systems***					
4.1.	Reassess the currect administrative software development program.					
4.1.1.	Conduct an independent study.	$75,000				
4.1.2.	Appoint a committee	No cost				
4.1.3.	Make required changes to all applications	Cost unknown				
4.1.4.	Require that all purchased packages are compatible.	Cost unknown				
4.2	Provide Information Services interim support					
4.2.1.	Identify internal resources.	No cost***				
4.2.2.	Use external resources as appropriate	Cost unknown	Cost unknown			

*** Reassign existing positions

5.	***Training***					
5.1.	Broaden the scope of the Personnel Office at the System Office.					
5.1.1.	Appoint a coordinator for System Office staff training in the Personnel Office	No cost				
5.1.2.	Establish a base-level of technical skill required for all staff.	No cost				
5.1.3.	Identify training needed, develop a training plan, and implement the plan.	No cost				
5.2.	Revise job description and include skills in personnel performance plans.					
5.2.1.	Identify the skills needed across the System Office, develop a training plan, and implement the plan.	No cost				
5.2.2.	Work with each employee to identify specific skills needed.	No cost				
5.3.	Provide training for technical staff.					
5.3.1.	Establish an Information Technology Training Center	Cost unknown				

Cost of Implementing Recommendations

74

75